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(54) Title: FIRE-RETARDANT AND BIOCIDE COMPOSITION AND PROCESS FOR ITS PREPARATION

(57) Abstract

The invention relates to a fire-retardant and biocide composition containing boric acid (H_3BO_3), borax ($Na_2B_4O_7 \cdot 10H_2O$ or $Na_2B_4O_7 \cdot 5H_2O$), binder and water. The invention also relates to a process for preparing such a composition. The process comprises the following steps: a) heating water to a temperature of 60 to 100 °C; b) adding boric acid and borax to the water by stirring; c) cooling the resulting solution to a temperature of 40 to 80 °C; and d) adding binder to the solution. The composition of the invention can be used particularly for protecting wood material and insulating boards against fire and biological growth.

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FIRE-RETARDANT AND BIOCIDE COMPOSITION AND PROCESS FOR ITS PREPARATION

The invention relates to a fire-retardant and biocide composition
5 containing borax and a certain binder, a process for its preparation, its use and products treated with it.

It is known to use boron-containing compositions as fire-retardant agents and anti-rot agents for protecting wood, see e.g. FI 44703, JP 57-191, 043 and DE 4,402,600. However, there are problems related to the above-
10 mentioned prior art compositions. For example, it is usually complicated to prepare and use them.

The object of the present invention is to eliminate the above-mentioned problems.

The invention relates to a fire-retardant and biocide composition,
15 characterized in that it contains boric acid (H_3BO_3), borax ($Na_2B_4O_7 \cdot 10H_2O$ or $Na_2B_4O_7 \cdot 5H_2O$), carboxymethyl cellulose (CMC) and water.

The invention also relates to a process for preparing the fire-retardant and biocide composition described above. The process is characterized in that it comprises the following steps:

- 20 a) heating water to a temperature of 60 to 100 °C,
- b) adding boric acid and borax to the water under stirring,
- c) cooling the resulting solution to a temperature of 40 to 80 °C, and
- d) adding carboxymethyl cellulose (CMC) to the solution.

The invention further relates to a concentrate which is characterized
25 in that it contains boric acid, (H_3BO_3), borax ($Na_2B_4O_7 \cdot 10H_2O$ or $Na_2B_4O_7 \cdot 5H_2O$) and carboxymethyl cellulose (CMC).

In addition, the invention relates to a method of protecting objects against fire and biologic growth. The method is characterized in that the objects are treated with the fire-retardant and biocide composition described
30 above.

Finally, the invention relates to a product which is characterized in that it is treated with the fire-retardant and biocide composition described above.

It has been found out that carboxy methyl cellulose (CMC) prevents
35 crystallization of boric acid and borax, and thus the composition may be prepared in a highly concentrated form, which also improves the effectiveness of

the composition. CMC decreases the surface tension of the solution and thus facilitates penetration of the solution into the product. In addition, CMC has adhesive properties which allow to bind the protective agent inside the product and on its surface.

5 The composition contains suitably 5 to 35, preferably 10 to 20 parts by weight of boric acid, 5 to 35, preferably 10 to 20 parts by weight of borax, 1 to 10, preferably 3 to 7 parts by weight of CMC, and 20 to 90, preferably 40 to 60 parts by weight of water. A particularly preferable composition contains 15 parts by weight of boric acid, 15 parts by weight of borax, 5 parts by weight of
10 CMC and 65 parts by weight of water. The concentrate according to the invention also contains the same components, except for the water, in the above-mentioned preferable proportions by weight. An advantage of a dry concentrate is that its handling is easy, which allows the preparation of an aqueous composition on the spot.

15 In addition to the above-mentioned components, the composition and concentrate of the invention may contain other components, such as cellulose fibres, viscose fibres and pigments, the amount of which is suitably 5 to 35 parts by weight, preferably 10 to 30 parts by weight. Suitable pigments include metal oxides.

20 According to the invention, the composition is prepared by heating water to a temperature of 60 to 100 °C, preferably to 80 °C, whereafter boric acid and borax are added under stirring. The resulting solution is cooled to a temperature of 40 to 80 °C, preferably to 60 °C, whereafter CMC and any other components are added to the solution by stirring. A dry concentrate is
25 obtained by evaporating the water off.

Examples of objects that can be protected against fire and biological growth with the composition of the invention are wood materials, concrete materials, cellulose-based materials, inside walls, roofs, sound insulating and heat insulating panels, acoustic boards, coating boards made of glass wool
30 and mineral wool, sheets made of cardboard, cellulose and paper, paints, adhesives, wallpaper pastes, and the like. In order to protect the object it is treated with a composition of the invention, or a composition or a concentrate of the invention is added to the object for example during the preparation process. The treatment can be carried out e.g. by spraying, spreading or im-
35 pregnating using high pressure or low pressure. It has turned out to be par-

ticularly advantageous to impregnate wood with the composition of the invention.

The composition of the invention also has the following advantages: it does not contain heavy metals, copper, chrome or arsine, and its pH is almost neutral.

5 The following examples illustrate the invention.

Example 1

A composition containing the following agents was prepared
15 parts by weight of boric acid,
10 15 parts by weight of borax,
5 parts by weight of CMC (Finnfix 30TM), and
65 parts by weight of water

Water was heated to a temperature of 80 °C in a vessel, whereafter
15 boric acid and borax were added to the water by stirring. The resulting solution
was cooled to a temperature of 60 °C, and CMC was added by stirring.

Example 2

A composition containing the following agents was prepared
20 2 parts by weight of boric acid,
2 parts by weight of borax,
1 part by weight of CMC (Finnfix 30TM),
20 parts by weight of cellulose fibres, length 2.8 to 3 mm,
1 part by weight of viscose fibres (VisilTM), and
74 parts by weight of water

25 Water was heated to a temperature of 80 °C in a vessel, whereafter
boric acid and borax were added to the water by stirring. The resulting solution
was cooled to a temperature of 50 °C, and CMC, cellulose fibres and viscose
fibres were added by stirring.

30 Example 3

A layer of 2 mm of the composition according to example 2 was sprayed onto an insulating board made of cellulose, whereafter the board was allowed to dry. The treated board did not catch fire nor did it become mouldy.

Example 4

A piece of wood was impregnated with the composition according to example 1 using high pressure. The treated piece of wood did not catch fire nor did it become mouldy.

5 Test results

In the tests carried out at the Technical Research Centre of Finland (VTT), insulating boards made of cellulose-viscose fibres which had been sprayed with the composition according to example 1 received value 1/1 in the surface class as well as in the fire spreading class. In the biological test no gas 10 was formed in the boards from rot fungus, putrefactive fungus or cellar fungus. Neither did any mould form on the boards.

In the six-month tests carried out by the VTT no biological growth formed on wood treated with the composition according to example 1. Furthermore, in the surface fire test the treated wood lasted quadruple the testing 15 time of surface fire class 1.

CLAIMS

1. A fire-retardant and biocide composition, **characterized** in that it contains boric acid (H_3BO_3), borax ($Na_2B_4O_7 \cdot 10H_2O$ or $Na_2B_4O_7 \cdot 5H_2O$), carboxymethyl cellulose (CMC) and water.
- 5 2. A composition according to claim 1, **characterized** in that it contains 5 to 35 parts by weight of boric acid, 5 to 35 parts by weight of borax, 1 to 10 parts by weight of CMC and 20 to 90 parts by weight of water.
- 10 3. A composition according to claim 2, **characterized** in that it comprises 10 to 20 parts by weight of boric acid, 10 to 20 parts by weight of borax, 3 to 7 parts by weight of CMC and 40 to 60 parts by weight of water.
- 15 4. A composition according to claim 3, **characterized** in that it contains 15 parts by weight of boric acid, 15 parts by weight of borax, 5 parts by weight of CMS and 65 parts by weight of water.
5. A composition according to any one of claims 1 to 4, **characterized** in that it also contains cellulose fibres.
- 15 6. A composition according to claim 5, **characterized** in that it contains 5 to 35 parts by weight of cellulose fibres.
7. A composition according to any one of claims 1 to 6, **characterized** in that it also contains viscose fibres.
- 20 8. A composition according to claim 7, **characterized** in that it contains 5 to 35 parts by weight of viscose fibres.
9. A composition according to claim 1, **characterized** in that it contains 2 parts by weight of boric acid, 2 parts by weight of borax, 1 part by weight of carboxymethyl cellulose, 20 parts by weight of cellulose fibres, 1 part by weight of viscose fibres and 74 parts by weight of water.
- 25 10. A process for preparing a fire-retardant and biocide composition according to any one of claims 1 to 9, **characterized** in that it comprises the following steps:
 - a) heating water to a temperature of 60 to 100 °C,
 - 30 b) adding boric acid and borax to the water under stirring,
 - c) cooling the resulting solution to a temperature of 40 to 80 °C, and
 - d) adding carboxymethyl cellulose (CMC) and any cellulose fibres and viscose fibres to the solution.
11. A process according to claim 10, **characterized** in that in step a) water is heated to a temperature of 80 °C.
- 35

12. A process according to claim 10 or 11, **characterized** in that in step c) the solution is cooled to a temperature of 60 °C.

13. A concentrate, **characterized** in that it contains boric acid (H_3BO_3), borax ($Na_2B_4O_7 \cdot 10H_2O$ or $Na_2B_4O_7 \cdot 5H_2O$) and carboxymethyl 5 cellulose (CMC).

14. A concentrate according to claim 13, **characterized** in that it contains 5 to 35 parts by weight of boric acid, 5 to 35 parts by weight of borax and 1 to 10 parts by weight of CMC.

15. A concentrate according to claim 14, **characterized** in 10 that it contains 10 to 20 parts by weight of boric acid, 10 to 20 parts by weight of borax and 3 to 7 parts by weight of CMC.

16. A concentrate according to claim 15, **characterized** in that it contains 15 parts by weight of boric acid, 15 parts by weight of borax and 5 parts by weight of CMC.

15 17. A method of protecting an object against fire and biological growth, **characterized** in that the object is treated with a composition according to any one of claims 1 to 9, or a composition or a concentrate according to any one of claims 1 to 16 is added to the object.

18. A method according to claim 17, **characterized** in that 20 the object is a wood material.

19. A method according to claim 18, **characterized** in that the object is an insulating board.

20. A method according to claim 17, **characterized** in that the object is a construction board made of cardboard, cellulose and paper.

25 21. A method according to claim 17, **characterized** in that the object is a paint.

22. A method according to claim 17, **characterized** in that the object is an adhesive.

23. A wood material, **characterized** in that it is treated with 30 a composition according to any one of claims 1 to 9.

24. An insulating board, **characterized** in that it is treated with a composition according to any one of claims 1 to 9.

25. A construction board made of cardboard, cellulose and paper, **characterized** in that the board is treated with a composition accord- 35 ing to any one of claims 1 to 9.

26. A paint, **characterized** in that a composition or a concentrate according to any one of claims 1 to 16 is added thereto.

27. An adhesive, **characterized** in that a composition or a concentrate according to any one of claims 1 to 16 is added thereto.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 98/00698

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: C09K 21/02, B27K 3/52, B27N 9/00, D21H 21/34, C09D 5/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: C09K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 33827/84 B (HICKSON'S TIMBER IMPREGNATION CO. (N.Z.) LIMITED), 18 April 1985 (18.04.85), the claims, examples and page 3, line 15 --	1-25
X	File WPI, Derwent accession no. 83-02779K(25), Jujo Paper Co Ltd.: "Mfg. heat-insulating and sound-proofaky materials - by first blending cellulosic fibre with mixt. of water repellent and/or size, protective colloid forming agent and flame retardant"; & JP,A,57191043, 821124 DW8302 --	1-25
A	US 5405555 A (ELWOOD N. RIKER DECEASED), 11 April 1995 (11.04.95) --	1-25



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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2255345 A (YU-CHENG CHANG), 4 November 1992 (04.11.92) --	1-25
A	DE 19516186 A1 (WILLOC HOLDING B.V.), 7 November 1996 (07.11.96) -- -----	1-25

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 5405555 A	11/04/95	WO 9632459 A	17/10/96
GB 2255345 A	04/11/92	NONE	
DE 19516186 A1	07/11/96	NONE	